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(54) Abstract Title

**Fat/whey emulsion for production of reduced-fat cheese**

(57) An additive for use in the manufacture of reduced-fat cheese comprises an aqueous mixture of a fat and whey protein concentrate treated to provide an emulsion. The fat is butter oil, heated to 60 degrees C and added to water containing whey protein concentrate (WPC) in powder form. The water may be distilled water or saline solution, and the WPC is up to 5% by weight of the butter oil. The mixture is blended and then homogenised to produce a creamy emulsion with fat droplets of less than one micrometer, coated with the whey proteins, which act as an emulsifier. The emulsion is then added to skimmed milk at a rate sufficient to provide a fat content of up to 50% by weight of the normal fat in milk, and this mixture is then used to make cheese.

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called cheese as they are not composed of dairy ingredients.

It is accordingly an object of the invention to seek to mitigate these disadvantages.

According to a first aspect of the invention there is provided an additive for use in manufacture of a reduced fat cheesy comestible, comprising an aqueous mixture of fat and whey protein concentrate treated to provide an emulsion.

The aqueous constituent may comprise water, preferably distilled water. This provides a simple yet hygienic aqueous carrier, which may alternatively comprise a saline solution having a salt composition similar to that of milk.

The fat may comprise a butter oil. This provides a required source of fat which is itself a natural dairy product.

The whey protein concentrate may be in the range 3% - 7% by weight of the butter oil. This is a preferred range for a desired flavour, particularly when the whey protein concentrate may comprise up to about 5% by weight of the butter oil, preferably 5% by weight of the butter oil.

The fat droplets may have a mean diameter of not greater than 1 micrometer. This again provides an enhanced flavour, particularly when the fat droplets may have a mean diameter of less than 1 micrometer.

The fat content may be in the range 20% - 40% by weight of the additive, preferably approximately 31%.

According to a second aspect of the invention there is provided a process for

The emulsion may be provided by a mixing step and an emulsification step, and the emulsification step may be provided by the protein(s) in the whey protein concentrate. This provides an inherent final emulsification stage.

The fat droplets in the emulsion after the mixing step may have a mean diameter of not greater than one micrometer.

The oil droplets may have a mean diameter of less than one micrometer.

According to a third aspect of the invention there is provided a process for the production of a reduced fat cheesy comestible, comprising the steps of providing an additive as hereinbefore defined, providing an additive made by a process as hereinbefore defined, adding said additive to skimmed cheese-milk, and subjecting the mixture to a cheese making process.

The additive may be added to the skimmed cheese-milk at a rate sufficient to produce milk of up to 50% by weight of the normal weight of fat in milk.

The process may comprise mixing the mixture of additive and skimmed cheese-milk to provide an homogeneous mixture.

The mixture may be subjected to a subsequent homogenisation step.

According to a fourth aspect of the invention there is provided a reduced fat cheesy comestible, whenever produced using an additive as hereinbefore defined or by a process as hereinbefore defined.

An additive for use in manufacture of a cheesy comestible, a process for

where fractures may start. This has the effect of compensating for the lack of fat and giving a texture on eating that is closer to that of full-fat cheese than the currently-produced version. In addition, the increased surface area of the fat droplets will help to develop a more normal flavour profile providing more interface between the fat and the protein where flavour-producing reactions take place.

The cream so produced is added to the skimmed milk at a rate sufficient to produce milk with up to half the normal amount of fat. It is mixed in to distribute it evenly.

It will be understood that the distilled water may be replaced by a saline solution having a composition comparable to that of milk. Also, in the process of making the creamy additive, the melted butter oil and distilled water (or saline solution) may be mixed, and the WPC powder may then be added.

The process may be summarised as the following seven steps:

1. Melt butter oil at 60°C
2. Add water
3. Add whey protein concentrate
4. First emulsification stage
5. Second emulsification stage
6. Add cream to skimmed milk
7. Make cheese

The texture of the cheese so made can be modified by using a suitable homogeniser to reduce further the size of the fat (oil) droplets.

comprising 5% by weight of the butter oil.

9. An additive according to any of claims 6 to 8, the fat droplets of the emulsion having a mean diameter of not greater than 1 micrometer.
10. An additive according to claim 9, the fat droplets having a mean diameter of less than 1 micrometer.
11. An additive according to any preceding claim, the fat content being in the range 20% - 40% by weight of the additive.
12. An additive according to claim 11, the fat content being approximately 31%.
13. An additive for use in manufacture of a cheesy comestible, substantially as hereinbefore described in the Example.
14. A process for making an additive for use in manufacture of a reduced fat cheesy comestible, comprising the steps of providing a liquid fat, providing an aqueous carrier and providing a whey protein concentrate, and then emulsifying the mixture to provide a creamy additive product.
15. A process according to claim 14, the step of providing the liquid fat comprising providing a butter oil and melting it to about 60°C.
16. A process according to claim 14 or claim 15, the step of providing an aqueous carrier comprising providing distilled water.

24. A process according to claim 22 or claim 23, the fat droplets in the emulsion after the mixing step having a mean diameter of not greater than one micrometer.
25. A process according to claim 24, the fat droplets having a mean diameter of less than one micrometer.
26. A process for making an additive for use in manufacture of a reduced fat cheesy comestible, substantially as hereinbefore described with reference to the Example.
27. A process for the production of a reduced fat cheesy comestible, comprising the steps of providing an additive according to any of claims 1 to 13, or an additive according to any of claims 14 to 26, adding said additive to skimmed cheese-milk, and subjecting the mixture to a cheese making process.
28. A process according to claim 27, comprising adding the additive to the skimmed cheese-milk at a rate sufficient to produce milk of up to 50% by weight of the normal weight of fat in milk.
29. A process according to claim 27 or claim 28, comprising mixing the mixture of additive and skimmed cheese-milk to provide an homogeneous mixture.
30. A process according to claim 29, comprising subjecting the mixture to a subsequent homogenisation step.
31. A process for the production of a reduced fat cheesy comestible,